

Adoption of Knowledge Creation Model in Team-based Project to Support Student Engagement

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The extant studies suggest educators and policymakers use different instructional methods and endeavours to promote student engagement. This exploratory study aims to evaluate the adoption of the Socialisation, Externalization, Combination, and Internalization (SECI) model for guiding team-based projects and its impact on students' engagement. We collected self-reported data from 64 college students who enrolled in a business subject and measured their perception on emotional, behavioural and cognitive engagement. Results indicated that students had higher engagement in the emotional aspect compared with behavioural and cognitive. Throughout the team-based group project development, it is noted that students are repositioned as autonomous learners who can steer their goals, efforts and knowledge.

Key words: *Emotional engagement, Behavioural engagement, Cognitive engagement, Knowledge management, SECI model, Team-based projects*

1. Introduction

It is an undeniable topic that strong student engagement is associated with positive academic outcomes, higher class participation, dedication to school work, extensive learning feedback, and motivation (Boekaerts, 2016; Dean & Jolly, 2012; Ho, 2016; Stobart, 2005; Wang et al., 2016). Harlen and Crick (2003) addressed that student engagement consists of a student sense of efficacy and control as well with the students' willingness to make use of effort to attain a learning goal. Under the conventional instructional pedagogy, instructors keep on delivering learning points



with PowerPoint slides, and handwriting notes on a whiteboard, while students keep on taking dutiful notes, claiming to be bored. However, the learning effectiveness is usually not encouraging as students are not genuinely engaged in the process (Conner & Pope, 2013; Jang et al., 2016; Prince, 2004). Some educators use team-based projects to simulate collaborative learning through defining objectives, setting goals, sharing ideas and taking responsibility (Sebba et al., 2008; Sultana & Zaki, 2015). The current study adopted the knowledge creation model (Nonaka & Takeuchi, 1995), socialisation, externalization, combination, and internalization (hereafter called “SECI”), in enhancing students learning experience with their team-based projects.

In a business subject, students were required to utilize their learnt knowledge and conducted a simulative workshop, with the theme “positive work environment” at the end of the semester. The instructor remodeled the instructional method, repositioned students as the active learners, and co-created an interactive learning ambience for learning experience. At the end of the course, 94 students were surveyed on learning effectiveness. The results from 68 valid responses revealed that the adoption of SECI in the learning process has positive impacts on students, in terms of emotional engagement, behavioural engagement and cognitive engagement. The study serves as a groundbreaking study to utilize the renowned knowledge creation model, SECI to acquire, share, exploit and experiment knowledge for effective learning. Educators are encouraged to revisit course design and incorporate different teaching pedagogies to enhance learning experience and student satisfaction.

After the introduction in Section 1, the concept of engagement is explained in Section 2. The notion of knowledge creation is provided in Section 3. The illustration of the SECI model integrating into the group project is explained in Section 4. After that, method and results of the learning experience are generated in Sections 5 and 6 respectively. The results of the study will be discussed in Section 7, followed by limitations in Section 8. Finally, implications and conclusions will be presented in Section 9.

2. Engagement

Student engagement is defined as a student’s active involvement and commitment in a learning activity and commitment to educationally practices (Appleton et al., 2006; Luen et al., 2012). In general, student engagement is extensively used as the predictor of personal development and learning (Carini et al., 2006). Literature suggests that engagement is primarily consisted of three interrelated dimensions: behavioural, emotional and cognitive engagement (Conner & Pope, 2013; Fredricks et al., 2016).

In this study, the three types of engagement are measured. Emotional engagement refers to students' affection, enjoyment, perception of values and interest towards learning tasks (Fredrick et al., 2016; Skinner et al.; 2008). Behavioural engagement refers to how students devote attention, exert effort and persistence in learning activity, and adherence to classroom rules (Appleton et al., 2006; Skinner et al., 2008). Cognitive engagement refers to students' efforts to in-depth thinking, elaboration of complex concepts and mastering of difficult tasks (Conner & Pope, 2013; Jang et al. 2016). Engagement is valued as a critical component for academic achievement. The levels of student engagement were positively associated with desirable learning outcomes like grades and critical thinking (Carini et al., 2006). High quality students' initial course engagement is important to facilitate student motivation and self-efficacy in study (Reeve & Lee, 2014). Kanaparan et al. (2017) reported that there was a strong positive relationship between behavioural engagement and performance in the subject of Introductory Programming. Lack of full engagement or disengagement is associated with passivity, withdrawal from participation in learning activities (Cole & Chan 1994; Heflin et al., 2017), truancy (Archambault et al., 2009), boredom, depression or anger during class (Luen et al., 2012) and dropping out from school (Finn, 1989).

3. Knowledge Creation Model

In the volatile and changing global environment, organizations are dedicated to knowledge management (KM), endeavours that enable employees to identify, capture, disseminate, create and apply their knowledge assets for business competitiveness (Abou-Zeid, 2002; Bandera et al. 2017; Lee & Choi 2003; Nonaka et al., 1996). In this connect, higher education institutions are playing a crucial role to prepare their students to acquire pertinent knowledge and skills in order to cater the evolving demand in future (Felicetti 2011; Adhikari, 2010). The seminal knowledge creation model, SECI (Figure 1) advocates the dynamic and continual growth of knowledge through four interrelated conversion modes: socialisation, externalization, combination and internalization (Nonaka & Takeuchi, 1995). It has been widely adopted in various studies to explain how management can promote knowledge creation and realize its benefits (Bandera et al., 2017, Escribá-Esteve & Urra-Urbieta, 2002; Hosseini, 2011). Putting the knowledge creation process in the classroom, the instructors can involve students to experience the four modes where their knowledge can be explicated, explored, connected and created for quality work and performance. The conversion modes are explained below.

Socialisation represents the process of sharing tacit knowledge among individuals, with the activation of their mental thoughts and connection with others through joint activities and social intimacy. Knowledge in this conversion mode is transferred from the source (individuals) to recipients (individuals) through action-based interaction (e.g., observation and experimentation)

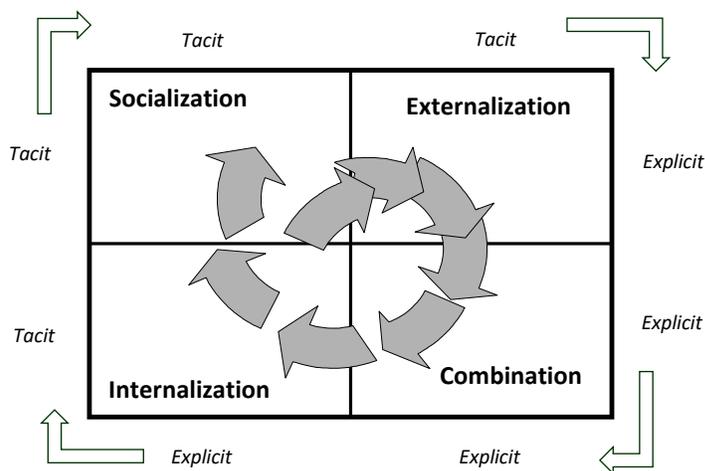
such as master-fellow-relationships, and imitation where tacit knowledge is hardly coded or documented (Bandera et al., 2017; Nonaka & Toyama, 2003).

Externalization involves the process of articulating tacit knowledge into explicit knowledge that can be understood by others. Individuals trigger explication activities in order to transcend their personal thoughts and skills into expressible concepts and ideas. Analogies and metaphors are commonly used to promote the reflection of images and revelation of logical minds through words, concepts, and figures (Dubberly & Evenson 2011; Markus 2001; Neve 2003).

Combination involves the process of systemising dispersed bodies of explicit knowledge and reconfiguring those in their own knowledge repositories. Individuals generate new knowledge through justification of existing paradigms of knowledge, which includes sorting, addition, filtering, integration, and adoption of knowledge from different streams of explicit knowledge (Hosseini 2011; Massey & Montoya-Weiss 2002; Sabherwal & Becerra-Fernandez 2003).

Internalization depicts the process of turning explicit knowledge into tacit knowledge through learning and action. It is suggested that individuals practise their acquired knowledge through learning-by-doing, and exercising in a way that enables them to experiment/re-experiment with knowledge in enacted actions (Hosseini 2011; Nonaka et al., 2000; Marwick, 2001).

Figure 1: Knowledge Creation Model



Source: Nonaka & Takeuchi (1995)



4. How Knowledge Creation Model is Embedded in the Group Project

The study was set in a business subject which lasted for 13 weeks. Every week, all students attended a 2-hour lecture and learned pertinent training concepts and learning models; and a 1-hour tutorial to foster and apply learned knowledge application. Other than attempting individual assessment, for instance, mid-semester test and individual writing, students were required to complete a group project.

In the first tutorial, the instructor explicitly discussed intended learning objectives and group management issues (e.g., project group size, intra-group evaluation, expected group coherence and dynamics (Chapman & Auken, 2001). Students were guided to take the role as in-house corporate trainers who would design and deliver “positive work environment” workshops to the colleagues (i.e., their peers). The workshop was delivered by the end of the subject, where instructor and classmates were assumed to be the workshop trainees. In a typical tutorial, students started with the progress of a project milestone, discussed what they came up with, collaborated and obtained feedback from the instructor to put forth the project’s progress.

Followed the SECI framework, students obtained their first socialisation experience in the first tutorial session through face-to-face communication. Once the project group was formed, students started a relaxed sharing on personal training experience, such as attending the orientation program of a part-time job, or free-vein chat of training scenarios they watched from TV programs.

Extend socialisation to group project: When students were brainstorming the group training theme, they had more extensive discussion ranging from personal perception and working experience related to “wellness”, to contemporary healthy staff practices from Fortune’s 1000 the Best Companies to Work. The instructor wandered around the classroom, listened and chipped in ideas to keep the conversation fruitful without limitation.

The capability to elucidate one’s idea to another is imperative for externalization. In the third tutorial session, all groups were invited to engage in a team-based competitive activity where they had to transport a ping-pong ball through cooperative actions. Two externalization sessions were arranged, pre-game dialogue and post-game review, so that students were able to explicate diverse views on the possible winning strategies, and articulation or analysis of other winning endeavors.

Extend externalization to group project: Based on the selected training theme, each team dug in the details through explanation of analogy on training objectives and methods, and an illustration



of a flow chart to show possible training tasks. Each group member was inspired to express views and crystallise ideas in order to contribute to collective knowledge.

Participating in regular lectures and project-driven group discussions in tutorial sessions, students were equipped with different sources of explicit knowledge related to training and development. To facilitate the combination of training concepts, the instructor invited an experienced corporate trainer to demonstrate essential training practices conducted in the workplace, such as using a real starvation problem in developing countries to stimulate the audience's creativity for diverse solutions, or deployment of various body languages from trainers in order to hold the trainee's attention.

Extend combination to group project: Students integrated and combined the pros and cons of training methods that were newly acquired with the pertinent ideas resided in their minds. Then, they configured with the most suitable training approach and activity tasks that suited their own project theme. Regular group discussions in tutorial sessions and outside classroom were conducive as team members were able to sharpen the effectiveness of their training prototypes, in terms of relevance, practicability and interest.

Embodying explicit knowledge into tacit knowledge allows students to internalize what they know and experience of different design phases constituting to effective training. The instructor provided students with another game-based group activity in the sixth tutorial session where they could experience and compare the learning effects from various degrees of clarity and structure to trainees.

Extend internalization to group project: Before the implementation of training workshops, students had to rehearse and operationalize all training steps and activities. The process of learning by doing is conducive as students were able to identify discrepancies between realised results from their planned idea through committing errors. They were encouraged to revisit their training design and shared mental thoughts, discussed and fixed those errors, then tried out corresponding stages through multiple attempts in order to improve the workshop before the actual run.

5. Method

The aim of the current study is to explore the degree of student engagement while students were guided and instructed to develop their themed-training workshops through using the knowledge creation model, SECI. The survey on engagement was administered after all the training workshops were conducted. They were assured that their responses would be kept with strict



confidence; data will be aggregated for purpose of the research study and not related to subject assessment. A sample of 94 college students were addressed, who enrolled in a training and learning subject taught by an instructor with a unified set of teaching materials. 64 of them responded and returned a completed questionnaire to the instructor (male: 34.3%; female 65.7%).

The questionnaire was composed of 12 questions that were used to measure three dimensions of student engagement (Appleton et al., 2006; Kanaparan et al., 2017). Four items were used to measure behavioural engagement (Jang et al., 2016; Skinner et al., 2008). Four items on emotional engagement were adapted and modified from Jang et al. 2016, Lin & Huang 2017, Skinner et al. 2008. Last, four items were used to measure cognitive engagement (Conner & Pope, 2013; Jang et al., 2016; Wang et al., 2016). The 12 items were scored on a five-point Likert scale, ranging from 1 as 'not true at all for me' to 5 as 'very true to me'.

6. Results of learning experience

The mean, standard deviation and reliability of the 12 items under the three dimensions of engagement are presented in Table 1. The results showed that students have the strongest engagement in the emotional aspect (mean = 4.102, SD = 0.810), followed by behavioural (mean = 3.989, SD = 0.833) and cognitive engagement (mean = 3.965, SD = 0.807). In light of the mean scores of all engagement items exceeding 3.5, it is implied that positive outcomes are associated with the use of the SECI model to the students' learning process. The Cronbach's alpha shown in Table 1 indicated that reliability of all constructs was above the acceptable threshold, 0.70 (Nunnally, 1978).

For emotional engagement, the mean scores of four items ranged from 4.031 to 4.203. The item 'Applying the course materials to our group project is meaningful.' was rated highest. The item 'I am proud with my ideas adopted in group project.' was rated lowest.

For behavioural engagement, the mean scores of four items ranged from 3.813 to 4.078. The item 'I participate actively in group based activities, such as mini games and role plays.' was rated highest. The item 'Even the task is difficult, I try to do my best to solve it.' was rated lowest.

For cognitive engagement, the mean scores of four items ranged from 3.609 to 4.281. The item 'I reviewed the noted and reading and make sure I can apply them in project.' was rated highest. The item 'I try to connect what I experienced or know from other training sessions.' was rated lowest.

Table 1: Mean, SD and Cronbach's Alpha of Measurement Items

Measurement Items	Mean	SD	Cronbach's alpha
Emotional engagement			0.861
E1: I really desire to learn the materials in class.	4.074	0.886	
E2: I am proud of my ideas adopted in the group project.	4.059	0.731	
E3: Applying the course materials to our group project is meaningful.	4.191	0.902	
E4: I find the learning environment is stimulating.	4.088	0.685	
Behavioural engagement			0.778
B1: I listen carefully to other ideas in discussion.	4.044	0.781	
B2: I participate actively in group-based activities, such as mini-games and role plays.	4.103	0.866	
B3: I devote efforts from beginning till implementation.	4.029	0.846	
B4: Even if the task is difficult, I try to do my best to solve it.	3.838	0.784	
Cognitive engagement			0.737
C1: I reviewed the notes and reading and make sure I can apply them in the project.	4.279	0.730	
C2: I think of different practices in order to deliver a quality project.	3.941	0.620	
C3: I try to connect what I experienced or know from other training sessions.	3.632	0.862	
C4: I always seek comments from instructors and team members for project progress.	4.015	0.680	

7. Discussion of the results

The objective of the present study was to examine the adoption of the SECI model for guiding group projects and its impact on students' engagement. The survey findings showed that students' engagement is positively influenced by SECI as students experience new approach to drive their project work in a collaborative learning atmosphere.

Students experienced strongest emotional engagement among the three dimensions. Compared with their prior experiences in team-based projects in other subjects which were rigid and limited in scope, students in this study were pleased to have more autonomy to steer their project theme



and progress (Jang et al., 2016). Students in each project group are perceived as unique learners with diverse backgrounds. Encompassed with a positive learning context and encouragement from instructor, students were disposed to explicate and exchange their ideas and personal experience through frequent socialisation and discussion. Whenever their ideas were accepted and adopted in the project design, students gained a strong sense of emotional fulfillment and satisfaction such as enjoyment and pride.

To enrich the project content, students have a strong drive and desire to learn and take in new concepts and theories from classes. Instead of sitting in lecture classes as passive recipients, students in this study were more enthused to combine and integrate what they acquired in class, configured with the pertinent personal experience for designing effective training to leverage contentment or wellness for peers. The project development process meant something interesting to students as it allowed students to bridge theory and practice together. Students realised a strong relevance and association of what they learn with what they do in tasks. In addition, under the guidance of the instructor to progress through the knowledge creation processes, SECI, students found the learning environment was student-centred and stimulating as they were the primary agents to harness the knowledge and direct the pace (Archambault et al., 2009; Conner & Pope, 2013).

The SECI model has positive impacts on students regarding their behavioural engagement. In each tutorial discussion session, students met their group members regularly, devoted time and efforts to ideate, design, develop and implement their training workshop. Students were attentive and listened to feedback or suggestions raised by group members in order to deliver a successful and fruitful simulative training to peers (Hwang et al., 2005; Taneja et al., 2015). Their input was incorporated and streamlined the workshop details through the externalization and combination stages. Moreover, students believed that effective learning is leveraged through doing. For those in-class activities, such as mini-games and role plays, students were vigorous and demonstrated a high degree of participation as they realised they could internalize their first-hand and direct experience, extend new thoughts, and thereafter advanced the design of their workshops (Jacob & Eleser, 1997).

Interestingly, the result of one of the measurement items in behavioural engagement, 'Even the task is difficult, I try to do my best to solve it.' is not aligned with our conjectured perception (Martin, 2013). It is worth noting that students might embrace with a "fixed mindset" (Dweck, 2008). They may feel frustrated when they encountered challenges or worry about the occurrence of failures in the project development process, which make them look imperfect or not smart. For example, students found their training process did not run smoothly as planned, and they evoked inevitably the sense of vulnerability and told themselves they could not get through the



setbacks. They may frame the challenges as threat and might cease developing new solutions or opportunities (Sultana & Zaki, 2015; Tawfik et al., 2018).

The findings indicated mixed results in cognitive engagement. Under the ubiquitous grade-oriented and performance competitive habitats, students are devoted to pursue pragmatic ways that allow them to achieve higher grades or perform well in assessment (Conner & Pope, 2013; Jacob & Eleser, 1997). The belief is extended to the team-project work where group members are cognitive active, thus they reviewed the notes and reading as it is a direct approach to demonstrate a high degree of theory application. They are also active to seek comments from instructors and team members to put forth the project progress.

Putting students in a more challenging cognitive context that requires them to broaden and extend thinking, is not an easy task (Mennenga, 2013; Nuthall, 2007). In relation to the aforesaid discussion of fixed mindset in behavioural engagement, students may have hesitance to risk their grades by doing a project with a topic that they find it interesting yet unusual or that they are unfamiliar with. They feel more comfortable with a well-regarded and well-established topic that they can extend ideas securely (Tawfik et al., 2018). Similarly, some students may not have a strong drive to devote additional cognitive effort to teach themselves through in-depth examination of the good attributes from their prior training and apply them in the current project.

8. Implications and Conclusion

The present study is a groundbreaking study that adopts the SECI model to guide students' team-based projects. In general, the findings reveal the positive impacts on three types of students' engagement: emotional, behavioural and cognitive aspects. Departing from the instructor-led teaching mode, students in this study took the primary responsibility of learning and experienced a series of dynamic processes to explore, integrate and apply their knowledge to achieve the goals and future career success. They were committed to the team-based project and enjoyed the learning process throughout the project development and knowledge application (Chapman & Auken, 2001). Our study can provide constructive suggestions as to the process of learning design, implementation and evaluation.

It is suggested that educators can redesign and redirect learning from a teacher-centred approach to be learner-centred approach that is conducive to learning performance and student satisfaction (Jacob & Eleser, 1997; Mennenga, 2013). Educators may adopt the knowledge creation model, SECI framework in the course and make the learning process more inspiring and enjoyable. In each mode of SECI, educators are the facilitators who empower and support their students to enjoy learning. Educators may provide free vein discussion among students to explicate



knowledge or personal experience; solicit extended ideas and feedback from instructors and peers to improve the work quality; experiment the collaborative thoughts through interactive presentation or workshops that are hosted by students; generate insight into group dynamics. Students will find learning outcomes are relevant and valued in their work, such as group projects are more meaningful. It is believed that learning activities can encourage emotional and behavioural engagement (Chapman & Auken 2001; Conner & Pope 2013; Davidson & O’Leary, 1990; O’Connor, 2013).

Some interesting findings were also identified when students encountered difficulties or novel problems throughout the project development process. It raises further consideration for learning practice. For behavioural engagement, while students reported they were devoted in class activities, few may not be able to cope with challenges effectively. For cognitive engagement, although students are more engaged in review taught materials and concepts, few may not be able to assimilate diverse thoughts flexibly. It may be associated with the learning strategies used by “robo-students” who predominantly garner high grades. They are strategically devoted for short-term memory for doing well in tests, yet do not actually enjoy or retain the learned knowledge (Pope, 2001). Educators can shape a healthier and all-rounded learning atmosphere with a balanced mix of assignments, tests and interactive activities. Teachers may provide more encouragement for students to attempt innovative or unusual thoughts. They may support students to stave off students’ fear or disgrace with their mistakes.

The extant researches address student engagement as unanimously crucial for quality learning. The findings of this study suggested that students are repositioned as autonomous learners who can steer their goals, efforts and knowledge through working in a group project, resulting in an engaged learning process. It is expected that the findings from the current study can assist educators in making informed decisions about student engagement and develop practices to nurture students as lifelong learners.

This study had several limitations that require future research. First, the generalization of results may be limited since the participants were solicited from students who enrolled in a subject. Future work can be conducted to embed the SECI model in other subjects with group projects as learning activities. The measurement focused on the student engagement of student-driven learning context. It can be extended to a comparative study of student engagement in other subjects that adopted instructor-driven and didactic approaches.



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